

A 2.5 Meg Socketed Ram Upgrade for the 1040ST

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A Shareware File by Barry Orlando Updated: December 28, 1989

Introduction

This shareware text file provides a procedure which details a 2.5 megabyte on board RAM upgrade project. The method described replaces 16 256K dynamic RAM chips with 16 one megabit dynamic RAM chips installed in chip sockets. Reinstallation of the ST's metal shield cover is also not impaired.

The beauty of this modification is that pin compatibility is simplified by the use of sockets instead of directly soldering the 1 meg RAM chips (DRAMs) to the motherboard and by the fact that the removed bank of sixteen perfectly reusable 256K DRAMs can be resold by you to persons upgrading 520STfm computers to 1 megabyte.

If you use this upgrade method, I recommend that you also utilize the high quality low contact resistance sockets that I've specified below (and not use standard sockets). These are the type and quality which are used on expansion boards made for the IBM clones.

I originally wrote this procedure to aid me in upgrading my own 1040ST's memory to 2.5 megabytes because I didn't want to trust myself with making mistakes and possibly damaging any of the electronic components, especially the new DRAMs which I didn't consider cheap. I might note that my 1040ST's pc-board was marked Rev D, but this procedure can be easily adapted to other revisions where boards still use 32 256K DRAMs to obtain a 1 meg configuration.

Disclaimer of Liability

I make no claim that this modification will work for you. I can only say that it worked for me and has been verified to me by registered users over the past year. This modification should not be attempted by anyone except by someone with experience repairing or building digital electronic circuits. Performing this modification will be done at your own risk and may void the warranty on your computer.

Background

The 256K dynamic ram chip differs from the 1 meg dynamic ram chip by having one additional connection, namely the address input A9. The following chip diagram illustrates this and shows pin layouts:

2-14

256K	
A8	1
Din	2
WE	3
RAS	4
A0	5*
A2	6*
A1	7*
VCC	8*

1 - 17

1meg	
Din	1.
WE	2 1
RAS	3 2
NC	4 3
A0	5 4
A1	6*5
A2	7*6
A3	8*7
VCC	9*8

Truth Table for above chips:

A0-A9	Address Inputs
CAS	Column Address Strobe
Din	Data In
Dout	Data Out
RAS	Row-Address Strobe
VCC	Power (+5V)
VSS	Ground
WE	Read/Write Input
NC	Not Connected
*	pc-board pin compatible
**	pc-board pin compatible on most chips

The 2.5 megabyte modification essentially reconnects all pins as previously connected on the lower of two banks of RAM chips plus adds a new line from the previously unused A9 pin on the ST's MMU (pin 64 of U15) to all new 1 meg chip pins A9 via a new 33 ohm resistor. Some of the Address leads are interchanged, but this has no effect on the operation of the computer.

Major Tools

1. Desoldering iron (I recommend the spring loaded type that incorporates the heat source.)
2. 15W grounded soldering iron (Radio Shack 64-2051 or similar)
3. Wire wrap clip and stripping tool
4. Exacto knife
5. 3-5 power magnifying glass or jewelers eyepiece

Parts Required

1. One 33 ohm resistor, 1/4 watt, 5%.
2. 5 feet length of 30 gauge wire, Kynar wire wrap solid conductor (Radio Shack 278-502).
3. 16 double contact low profile dual-in-line I.C. sockets (D.C. Electronics catalog no. T02-18, cost: \$0.12 each)
4. Pack of 10 "Socket Wrap ID" (D.C. Electronics catalog no. 16-ID, cost: \$2.05) You can get in touch with D.C. Electronics at the following location:

D.C. Electronics
P.O. Box 3203
Scottsdale, AZ 85257
(800) 423-0070

5. 16 one megabit dynamic RAM chips, 120ns or faster (I used Hitachi Part no. HM511000-12, and paid \$24.00 each plus state tax and \$4.00 shipping from Ed at Computronix on Dec 16, 1988). You can get in touch with Ed at the following location:

Computronix
2151 A O'Toole Ave.
San Jose, CA 95131
(408) 943-0771

Work Area

Prepare your work area by placing a towel on your flat working surface and cover it with a layer of aluminum wrapping foil. This provides padding for the components and a conductor for static electricity.

Precautions

Since the slightest static discharge could easily damage components on your computers pc-board, always keep one hand on the metal foil bonded along the outer rim of the pc-board before and during touching any part of the pc-board or its components. Avoid working on this project when the humidity is low.

Procedure

1. After removing the pc-board from the insides of your computer, desolder and remove the front 16 256K chips (U32 through U45 and U16 through U30).
2. Using the Exacto knife, cut the following traces on the top side of the pc-board:
 - a. Between U30's pin 1 and U61's pin 1.
 - b. Between pin 14's of U32 through U45 and U16 through U30 and other pin 14's of U46 through U61.
 - c. Between the thru-hole (nearest to pin 1 in center of U32) of U32 and U46's pin 1. (Note: This thru-hole traces to U32's pin 1 on the underside of the board.)
3. Using the Exacto knife, cut the following traces on the bottom side of the pc-board:
 - a. Between U30's pin 1 and the 33 ohm resistor R76.
 - b. Between U32's pins 2 and 14. Do the same for U33 through U45 and U16 through U30.
 - c. Between U30's pin 4 and U15's pin 8. (Note: Cut the trace after it goes through the board to the bottom side near resistor R91, but before it reappears on the top of the board via another thru-hole.
 - d. Between U32's pin 14 and the thru-hole located between U32 and U33.
4. Preparing New Sockets and Soldering Them Inplace:
 - a. On all 16 new sockets, remove the internals of pin 4.
 - b. On all 16 new sockets, bend all pins 1 and 17 flat against their bottom then up against their outer side.
 - c. On 14 of the new sockets, bend pin 18's flat against their bottom and pointing straight out to the side.
 - d. On the remaining two, bend both pin 18's flat against their bottom but back and down so it will just reach and fit into the pc-board hole of it's adjacent pin (pin 17). These two sockets will be installed and soldered with the socket's pin 18 going into the old 256K chip's pin 16 hole below the new socket's pin 17. Trial fit these two sockets at this time.

e. Using a pair of scissors, cut eight of the "Socket Wrap-ID" plastic markers in half for sandwiching them between the new sockets and the pc-board during installation. These little plastic markers electrically isolate the socket's pins 1 and 17 from leads and traces on the pc-board, and from pin 18 of the socket for the two separately prepared sockets above, but must also be trimmed slightly so as not to interfere with seating the socket's four pads flush with the top of the pc-board upon installation.

f. Solder the two sockets with the bent back pin 18 and markers into U30 and U32.

g. Solder the remaining sockets with markers into U34 through U45 and U16 through U29. Pin 18 of these socket's must be soldered to the top of the board at the nearest thru-hole that the pin 18 just barely reaches. Use plenty of heat as these thru-holes are big heat sinks.

5. Mounting The New 33 Ohm Resistor:

Install a new 33 ohm resistor on the pc-board by drilling two small holes from the top at points near capacitor C55 and resistor R70. Make sure you don't drill through a trace on the other side by holding the pc-board up to a bright light and marking the spots with a pencil.

6. Wiring:

Wire the following connections on the top side of the board:

- a. Between U32's new socket's pins 1 and 17 and a thru-hole on the pc-board between U32 and U33. This thru hole is the only one that has a trace that runs to another thru-hole between U46 and U47 on the top side of the board.
- b. Between U16's new socket's pins 1 and 17, and pin 2 of U54. Solder the wire directly to the side of the chips pin 2.
- c. Between each of the remaining new socket's pin 1 and 17 and a thru-hole in back of each 256K RAM chip (i.e., U47 through U53 and U55 through U61). These thru-holes are the ones that you will find traces back to either pin 2 or pin 14 of U47 through U61 and then trace over toward U22, U23, U26, and U27. Actually, pins 2 and 14 are tied together on the bottom of the board for every 256K RAM chip still installed. So that's 14 more wires altogether (i.e., each new RAM chip's pins 1 and 17 will be connected to the pins 2 and 14 of the 256K chip directly in back of it).

Wire the following connections on the bottom side of the board (Note: all pin numbers here refer to the pin numbers on the pc-board, not the pin numbers of the new sockets or new ram chips):

- d. Between U15's pin 64 and one side of the new 33 ohm resistor.
- e. Between all pin 14's of U32 through U45 and U16 through U30, and the other side of the new 33 ohm resistor.

- f. Between all pin 2's of U32 through U45 and U16 through U30, and the thru-hole near R91 which had its trace cut to U30's pin 4. This thru-hole traces back on top of the pc-board under the bank of resistors and over to U15.
 - g. Between U61's pin 1, U30's pin 4, and the cut trace side of resistor R76.
 - h. Between U30's pin 1 and U61's pin 3.
7. Inspect all solder joints with the magnifier for solder shorts and faulty connections. Verify that all connections were made correct.
 8. Install the new 1 meg RAM chips into their new sockets.
 9. That's it! Clean isn't it? Now sit back and admire your work.
 10. Reassemble the computer and reconnect the monitor and power cord and let it whirl!

Support Files and Diagnostic Software

Also included with this archived file, are following support files:

SYSTAT7.PRG - This handy public domain utility shows some neat things going on inside of your computer. Of special interest is the size of the ram.

BANKSTAT.TOS - This program displays a table of possible memory configurations consistent with those published in the hardware specification from Atari Corp. (Developer's Docs). This program also reads into memory and displays the current memory configuration for reference.

BANKSTAT.C - This is the C source code for BANKSTAT.TOS

MEMTESTR.TOS -This program performs a test of Bank 0 (the new 1 megabit chips installed by 25MGUPGD.TXT) for data integrity and reports any defective DRAMs including the specific IC number. This program requires all available RAM. Boot the computer without desk accessories, ramdisks, or Auto folders with files that take up RAM, then run it.

MEMTESTR.C - This is the C source code for MEMTESTR.C

4MGUPGD.TXT - This text file provides instructions for upgrading the 2.5 meg 1040ST to 4 megs.

Shareware Policy

I am distributing this documentation as a \$15.00 Shareware File.
Please feel free to re-post on your favorite Information Service or
local BBS. I ask only that you do so in its original unaltered form.

If you have followed these instructions and everything worked for you,
I'm sure you will appreciate the effort I put into documenting this
project and the money it has saved you from buying one of those
expansion boards on the market or by the time you could have spent
trying to figure such a project out by yourself. Please send your
shareware user registration fee to:

Barry Orlando
1120 Deerfield Dr.
Napa, Ca 94558

I can also provide two 8x10 photographic color prints which show the
completed 2.5 meg modification on my 1040ST (One print for each side of
the motherboard). These prints may be helpful since they show how the
completed wiring should look. If you want a set of these prints,
please pre-register, and request them.

Good Luck!